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ABSTRACT

The principal objectives of this study of the costs and benefits of graduate education (the Gradcost Study) were: (1) to collect on a comprehensive nationwide basis published and other available information concerning the total costs and benefits of graduate education in colleges and universities; and (2) to summarize and analyze this information so as to identify and evaluate by discipline, by level, and by apparent quality of the graduate program and the type of institution (a) the major elements of total costs and benefits in graduate education, (b) the definitions of these elements, (c) the alternative procedures for allocating these total costs and benefits, and (d) illustrative data giving ranges of total costs and benefits. (HS)

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THE COSTS AND BENEFITS OF GRADUATE EDUCATION: A COMMENTARY WITH RECOMMENDATIONS

By

Joseph L. McCarthy and David R. Deener

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THE COUNCIL OF GRADUATE SCHOOLS IN THE UNITED STATES

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The Council of Graduate Schools / Washington, D.C. / March 1972

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Inquiries concerning additional copies of this and companion documents should be addressed to The Council of Graduate Schools in the United States 1 DuPont Circle, Washington, D. C., 20036

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TABLE OF CONTENTS

		Page
	Introduction	i
	Foreword	ii
1.	The Gradcost Study	1
2.	Graduate Education	2
3.	The Nature of the Literature	6
4.	Outputs	7
5.	Benefits	10
6.	Cost and Program Definitions	14
7.	Direct and Support Costs	19
8.	Graduate Student Fellowship and Assistantship Costs	24
9.	Research Costs	26
10.	Total Costs, Joint Outputs and Unit Costs	31
11.	Available Estimated Costs	35
12.	Conclusions and Recommendations	40

FIGURES

1.	Outline of College or University Programs Suggesting Main Inputs and Outputs	4
2.	Possible Pattern of Assembling Estimated Costs Relating to Discipline (e.g. Chemistry)	18
3.	Available Estimates of Ranges of Unit Costs Master's Degree Programs	37
4.	Available Estimates of Ranges of Unit Costs Doctor's Degree Programs	38

INTRODUCTION

The Council of Graduate Schools in the United States, as a sponsor of the Study on the Costs and Benefits of Graduate Education (the "Gradcost" Study) which has led to the following report by Joseph L. McCarthy and David R. Deener as well as two others by John H. Powel, Jr. and Robert D. Lamson, hopes that these results are found useful by the many individuals and organizations interested in graduate education.

The Council's Gradcost Committee (listed below) has given substantial help by participating in guiding the Study. Important assistance has also been given by reviewing drafts of reports, although it should be recorded that the authors alone are responsible for the contents of the papers and these should not be taken as policy statements of the Council.

COUNCIL OF GRADUATE SCHOOLS GRADCOST COMMITTEE

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State University System of Florida

Robert H. Wessel
University of Cincinnati

The contributions of this Committee, as well as all other persons and organizations participating in this Study, and especially the National Science Foundation, are deeply appreciated.

J. Boyd Page

J. Boyd Page, President
Council of Graduate Schools in the United States

FOREWORD

This study and analysis of the literature relative to the costs and benefits of graduate education (the GRADCOST study) was begun as a result of a resolution passed in December, 1968 at the Annual Meeting of the Council of Graduate Schools in the United States (CGS). Shortly thereafter, discussions were undertaken with representatives of the National Association of College and University Business Officers (NACUBO) and it was agreed to proceed with a study under joint sponsorship. This paper sets forth part of the results arising from this study.

A Joint Gradcost Committee was appointed by the officers of CGS and NACUBO, which also included representatives of the National Academy of Sciences and the Western Interstate Commission on Higher Education. Meetings were held in May, July, October and December of 1969 at which the Joint Committee concluded that a study and an analysis of the literature should be carried out as the first step toward securing the information needed in the field. On April 30, 1970, the National Science Foundation granted $78,000 to the CGS to assist in paying the costs of the study.

The study itself has been carried out by the Gradcost Research Group, which has worked in Seattle under a subcontract between the CGS and the University of Washington. Personnel were: Dr. Joseph L. McCarthy (Director), Mr. James. F. Ryan (Co-Director), Dr. Robert D. Lamson (Project Coordinator), Mr. John H. Powel, Jr. (Research Analyst).

The collection of the literature and the development of concepts for analysis and reporting the results were performed by Dr. Robert D. Lamson and Mr. John H. Powel, Jr. The results of their analysis are presented in two parts:

> Elements Related to the Determination of the Costs and Benefits of Graduate Education, by John H. Powel, Jr. and Robert D. Lamson
>
> An Annotated Bibliography of Literature Relating to the Costs and Benefits of Graduate Education, by John H. Powel, Jr. and Robert D. Lamson

Major credit belongs to Mr. Powel for organizing and reviewing most of the massive body of literature covered, and especially for developing the conceptual framework used to analyze cost studies. The authors also assumed responsibility for coordination of this effort with the Cost Finding Principles Project now underway at the National Center for Higher Education Management Systems at the Western Interstate Commission for Higher Education. The

contributions of these authors are greatly appreciated.

While the publication of these two papers concludes the joint effort of the CGS and NACUBO, it is clear that the existing literature leaves some of the most important questions which prompted the study unresolved. Among the problems unanswered are:

1. Adequate identification of the outputs and benefits of graduate education;
2. Agreement on how separately budgeted research and financial aid should be treated in determining the costs of graduate education;
3. Lack of a definitive and generally accepted set of procedures for allocating indirect costs to the output costs of graduate education;
4. Lack of comparable data on a broad basis as to the actual costs of graduate education.

These unanswered questions and unresolved issues lie at the heart of the problems besetting graduate education and should be the subject of continuing research, even though definitive answers and solutions may not be in the immediate offing.

It should be pointed out that the National Center for Higher Education Management Systems at WICHE is presently conducting empirical research on many of the unanswered questions listed above through projects dealing with cost finding principles, models for interinstitutional exchange of information, and measurement of the outputs of higher education.

As a more immediate commentary, Deans Joseph L. McCarthy and David R. Deener have authored a position paper which presents an alternative view of some of the issues raised in the literature and includes their recommendations on some key points. Their efforts are presented in a separate report sponsored by the CGS alone:

The Costs and Benefits of Graduate Education: A Commentary with Recommendations, by Joseph L. McCarthy and David R. Deener

It is recognized that this paper may not represent the views of some segments of the higher education community. In particular, it should be noted that the National Association for College and University Business Officers is not associated with this effort.

The Joint Gradcost Committee (listed below) has given substantial help to the Gradcost Study by providing general guidance and by reviewing drafts of the papers and reports. The contributions of the Joint Committee, and particularly the Steering Committee, are deeply appreciated, although they cannot be held responsible for the specific contents of the papers resulting from the study.

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John Weaver
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Robert H. Wessel
University of Cincinnati

*Steering Committee members

Close communication has been maintained with representatives of the National Science Foundation and the advice and aid provided by Justin C. Lewis and Felix H. I. Lindsay, Study Director and Associate Study Director, respectively, of the Science Education Studies Group, and also Charles Falk, the Planning Director, have been very helpful.

Finally, appreciation is expressed to the graduate deans, financial affairs officers, faculty, students and public officials of the nearly 400 institutions and organizations who gave help and advice, and especially to the members of the Executive Committee of the CGS and the NACUBO for their continuing encouragement and support.

We hope and expect that the results of this study will be found useful by officers, faculty and students of colleges and universities in the United States, by representatives of government agencies, foundations, private donors, and indeed, citizens who are concerned with graduate education.

The Joint CGS-NACUBO Steering Committee

By David R Deener
David R. Deener, Chairman

THE COSTS AND BENEFITS OF GRADUATE EDUCATION: A COMMENTARY WITH RECOMMENDATIONS

by

Joseph L. McCarthy and David R. Deener

1. THE GRADCOST STUDY

The principal objectives of the Gradcost study have been: a) to collect on a comprehensive nationwide basis published and other available information concerning the total costs and benefits of graduate education in colleges and universities; b) to summarize and analyze this information so as to identify and evaluate, insofar as practicable and possible, by discipline, by level, and by apparent quality of the graduate degree program, and the type of institution: (i) the major elements of total costs and benefits in graduate education, (ii) the definitions of these elements, (iii) the alternative procedures for allocating these total costs and benefits, and (iv) illustrative data giving ranges of total costs and benefits.

This Gradcost Commentary* consists in part of a summary of some of the information contained in another Gradcost report by John H. Powel, Jr. and Robert D. Lamson, which is entitled Elements Related to the Determination of the Costs and Benefits of Graduate Education** and presents an excellent review and analysis of the subject literature.

The Commentary sets forth the authors' personal views concerning the identity and preferred treatment of some of the difficult problems associated with consideration of the costs and benefits of graduate education. We have consulted widely and now in many cases suggest quite definite positions, although we expect that others will show that some of these

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*For the important advice and assistance received, we are deeply grateful to our colleagues James F. Ryan, Robert D. Lamson and John H. Powel, Jr., to each of the members of the Gradcost committees, to the graduate school and financial officers in the many colleges and universities and other interested persons who have contributed to this study, and to the National Science Foundation which has provided funds to assist in its support. J.L.M. and D.R.D.

**In the text of this commentary, reference to information reported in the literature usually is made by referring to the appropriate pages of the Powel-Lamson paper by using the designation (PL, 175-180), for example, to refer to pages 175 to 180.

will need to be abandoned or changed as further studies progress. Our intent is to outline in general terms a more or less consistent system which may be applied if needed in current situations as a base for consideration of the costs and benefits of graduate degree programs.

We believe that this Commentary reflects in general the views of many in the graduate school community and hope that it may provide a stimulating framework for the further studies which are urgently needed.

2. GRADUATE EDUCATION

Western society, for more than a thousand years, has supported higher education in the form of colleges and universities.

Graduate education has come into being mainly during the last century. Its growth has been rapid and ubiquitious, and during 1970 some 29,000 Ph.D. degrees and 219,000 Master's degrees were awarded in the United States.

Graduate education will be defined in this paper as post-baccalaureate study in any field except those leading to the doctoral degrees in such professional fields as medicine (M.D.), dentistry (D.D.S.), law (J.D.), and perhaps a few others.

In the United States, some 250 and 700 institutions offer Doctor's and Master's degrees, respectively and among these colleges and universities substantial differences exist in concepts, definitions, practices and indeed of objectives in relation to graduate education. During 1967 and 1968, however, some agreements in principle* were reached on a national level by the Council of Graduate Schools in the United States ("CGS") and by the Association of Graduate Schools ("AGS") in the Association of American Universities as to the fundamental nature of graduate degree programs.

The Graduate Degree Program and Its Elements

Graduate education is always specialized relative to a particular discipline, or field, or area. The graduate student's experiences are planned and he is guided usually by the graduate faculty in a department, school, college or some other academic unit organized around a particular discipline or field.

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*These several statements have been published by the CGS under the titles: "The Doctor of Philosophy Degree," "The Doctor's Degree in Professional Fields," "The Master's Degree," and "The Nature and Naming of Graduate Degrees," etc. with endorsement by the CGS, or both by the CGS and the AGS.

This faculty offers the graduate degree program which we now define as the set of experiences and challenges offered to the graduate student to be satisfactorily completed in order to make appropriate the award to the student of the degree of Master or Doctor, or the like.

The essence of graduate education resides in the graduate degree program. At the outset, therefore, we recommend that the graduate degree program be recognized as the appropriate unit for consideration of the total costs and outputs of graduate education.

A graduate degree program usually includes all or most of the following elements: a) lectures, seminars, and guided independent study; b) use of special facilities such as libraries, laboratories, computers, etc.; c) research or investigational activity; d) internship or guided introduction to professional practice; e) student services, such as admission, enrollment, counseling, housing, health activities, etc.; f) operational and administrative services for handling both academic and fiscal affairs; and g) graduate student financial aid.

Some of the relationships associated with graduate degree programs are suggested in Figure 1.

Types of Graduate Degree Programs: A Three-Level Two-Track Concept*

Graduate programs may lead to degrees at three different levels: Master - a degree awarded after successful completion of one or two years of post-baccalaureate study; Candidate (or Master of Philosophy, or Specialist, or Engineer, etc.) - a degree or certificate usually associated with completion of all requirements for the doctorate with the exception of the dissertation, Final Examination and sometimes an internship, and usually requiring one or two years of post-Master's study; and Doctor - a degree signifying completion of a dissertation, and sometimes an internship, and a Final Examination, usually requiring one to two years of full-time study beyond the Candidate level. Candidate, Master of Philosophy, and similar intermediate awards have been given only recently.

Two different types of graduate programs also may be recognized: "research-oriented" programs - preparation for a career in scholarly work and research including the discovery of new knowledge, often in association with teaching at a university or college, and leading to degrees such as

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*To simplify subsequent discussion, we shall hereafter refer usually simply to the graduate degree program and mean either the Master's and/or Doctor's degree program in that field.

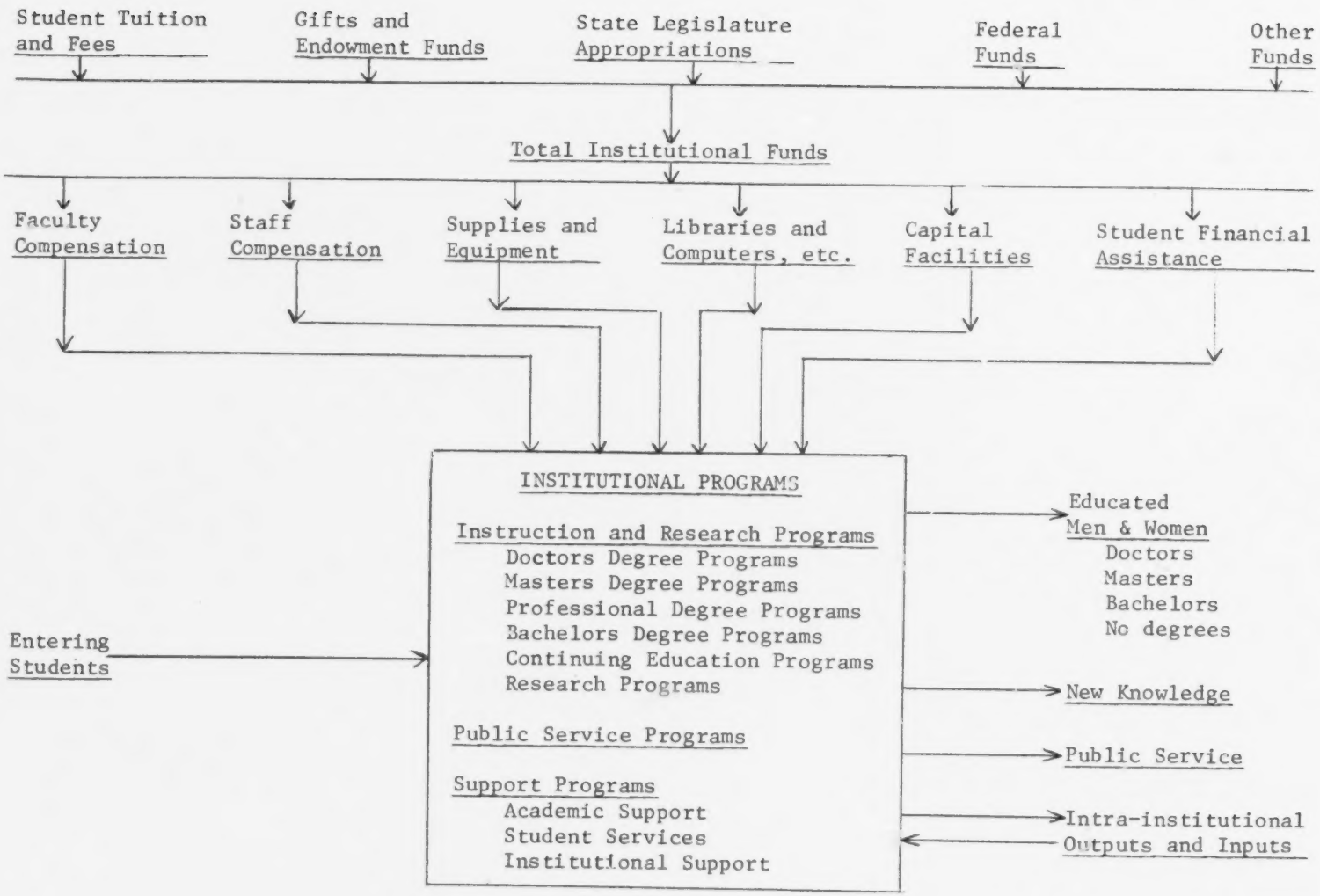

FIGURE 1. OUTLINE OF COLLEGE OR UNIVERSITY PROGRAMS SUGGESTING MAIN INPUTS AND OUTPUTS

the Master of Arts, Master of Science, and the Doctor of Philosophy; or "practice-oriented" programs - preparation for a career in the practice of a profession involving primarily the application of existing knowledge, and leading to degrees such as the Master of Social Work, Master of Librarianship, Master of Education, or Master of Business Administration, and the Doctor of Arts, Doctor of Education, Doctor of Musical Arts, and others.

Faculty Needed for Graduate Degree Programs

Colleges and universities which undertake to offer graduate degree programs must recruit and maintain qualified faculties with an appropriate commitment to research, whereas in undergraduate and community colleges, faculty devote main attention to formal teaching.

Institutions which offer Doctor of Philosophy degree programs must be staffed with professors who can and do study and teach at the frontiers of knowledge, examine the quality of the evidence available, extend evidence and concepts to the production of new knowledge, educate or train graduate students who themselves discover new knowledge, and finally advance the institution's overall capabilities in original scholarship and research. In colleges and universities which offer Master's but not Doctor's degree programs, the faculty and students have less opportunity to conduct research, and tend to engage correspondingly more in the transmission of existing knowledge by formal teaching.

Some Questions Concerning Graduate Education

Many questions have been raised in recent years concerning graduate education on a national, regional and state level and within the colleges and universities themselves. Some of these questions are: a) what types and levels of quality of graduate degree programs are appropriate?; b) how many graduate degree programs of particular types and how many enrollees are appropriate?; and c) what proportion of the costs of graduate degree programs appropriately should be paid for by the public, including state and federal taxpayers as well as private donors, and by the graduate students?

The Gradcost study may contribute some helpful background with respect to these matters, but answers to these questions must remain to be found in the future.

3. THE NATURE OF THE LITERATURE

The nature of the literature on costing in higher education and its historical development as viewed by Powel and Lamson (PL, 10-16) is summarized in the following paragraphs.

Literature

Information concerning the costs of graduate education has appeared in the literature at least since the 1890's. The early reports tended to consider costs which describe or qualify the input side of the program and benefits which describe or evaluate the outputs as being synonymous; many studies ignored the benefits of graduate education. The more recent literature recognizes the differences between costs and benefits and the need to evaluate cost information in light of independently measured and evaluated benefits.

Cost studies undertaken up to the 1960's usually had a dual purpose: to justify requests for legislative appropriations or alumni donations and to promote economies in operations, with emphasis on the first purpose. The studies focused on total institutional costs of various educational outputs, rather than on the way in which costs vary with outputs. Average cost information was often used where marginal or incremental cost information would have been more appropriate. Analysis of benefits emphasized intangibles. Higher education usually was not regarded as an economic process.

The more recent literature tends to view higher education as an economic process, competing for the favor of many clients, students, state legislatures, federal agencies, private foundations and donors. Stress is placed on relating cost information to outputs and eventually to benefits, and the use of cost and benefit information for allocation of resources both within the institution and without. The use of theoretical and analytical tools, drawing on the concept of maximization such as linear programming is increasingly suggested, but as yet such tools remain largely non-operational insofar as their use in deriving information is concerned. The various inputs, outputs and benefits have become more clearly identified, but there is far from general agreement on, or acceptance of, ways to measure and evaluate the outputs and benefits.

Some of the most recent literature reflects criticisms of graduate education and the purported oversupply of Ph.D.'s in some fields, and calls for radical changes in higher education.

Commentary

In general the literature indicates considerable divergencies in basic academic philosophy and concepts of graduate education, and this is not surprising in view of its very rapid expansion during recent years, and of the widely differing types and levels of quality of graduate degree programs which have come into being during this expansion.

No consensus is evident as to the most desirable conceptual base on which to develop the costs of graduate education. The graduate degree program, although widely recognized in the academic community and in our opinion the paramount unit upon which costs and benefits must be considered, apparently has not in the past been the explicit focal point for graduate education cost studies.

Further, and in part as a consequence of conceptual weaknesses, the literature offers very little information concerning specific costs or detailed procedures for estimating costs of graduate education in a manner so as to yield comparable data.

4. OUTPUTS

A graduate degree program may yield as outputs educated men and women, new knowledge, enhanced public service and intra-institutional contributions as indicated in Figure 1.

The Literature

The following outputs were identified in the literature (PL, 42-46): a) the graduate degree; b) components of the degree such as (i) credit hours; (ii) a course; (iii) a year's study; (iv) required research skills; (v) the dissertation or thesis; c) other outputs which were seen to be not a part of the formal degree program, such as (i) services of teaching assistants and teaching experience gained; (ii) services of research assistants and research experience gained; (iii) graduate fellowship experience; (iv) public lectures and recitals; (v) public use of physical facilities including library collections; and (vi) research publications.

Commentary

The Primary Output - Educated Men and Women

The raison d'etre of a graduate degree program - its primary output - is men and women educated or trained to the Master's or Doctor's level in a particular discipline or field.

Thus, assuming that achievement of at least a minimum level of good quality consistently can be associated with the award of a particular graduate degree, the number of graduate degrees awarded in our opinion is the obvious and preferred quantitative measure of output of a particular graduate degree program.

However, because some graduate students do not complete their programs and also because it is useful to estimate instructional outputs almost currently instead of waiting one to several years until the graduate degree is awarded, completion of identifiable parts of graduate degree programs is recognized. The most frequently used measure of completion of a part of a program is the education or training of a graduate student (full-time equivalent) for a period of one academic year. The shortcoming of this kind of counting is that the whole is more than the sum of the parts. This difficulty is important in all graduate degree programs, but is of essential significance in Ph.D. programs when satisfactory completion of the dissertation research is the core requirement for completion of this degree program. Nevertheless for short-term purposes and recognizing its inadequacy, the training of a full-time equivalent student for one academic year is recommended as a useful secondary measure of output which reflects the value added on a current basis.

However, the simple counting of the number of graduate degrees awarded is in itself an inadequate measure of output because certain graduates will have achievements and capabilities and promise for significant contributions to society far above the threshold of attainment needed to qualify for their graduate degree. High quality in a particular graduate may arise in part as a result of the special influence of the excellence of his graduate program professors and other significant elements, and also in part as a result of the level of ability and undergraduate education and promise inherent in this graduate student on the day he entered graduate school.

Within a particular graduate program at a particular institution, the relative quality of a particular graduate student can be and indeed is measured, for example, in terms of the level of the grades which he is awarded in formal courses, the time which he has taken to complete his graduate degree, the quality of his Master's thesis or Doctor's dissertation, and other appraisals by his peers and professors. Among the several institutions offering graduate degree programs in a particular field, evidence

of the relative quality of men and women graduates is available mainly in terms of achievements in their subsequent careers.

Our conclusion is that the output of educated men and women flowing from a graduate degree program must be considered in terms of both the number and quality of its graduates. In order to permit better evaluation of such outputs, new ideas and procedures for estimation of quality of graduates are urgently needed.

New Knowledge

Colleges and universities have always been centers for knowledge, for the preservation and transmission of knowledge, and now particularly in the case of some graduate institutions, for the advancement of knowledge. Traditionally, as a significant part of his educational training and examination program, each prospective Master or Doctor put forth certain new propositions in his thesis or dissertation, and then presented evidence publicly to defend the validity of these propositions. Now, faculty and graduate students, and sometimes joined by research staff personnel, may generate substantial new knowledge, and especially as an output from Doctor of Philosophy degree programs.

Generally the amount and quality of output of new knowledge is difficult to measure, although the professor's output of new knowledge is usually taken into account when consideration is given to his promotion or a salary increase. Research publications can be counted, and the reputation of journals can be appraised. But the importance over the next several years or decades, and the probable societal benefits of the new knowledge arising from a particular graduate student's Doctor's dissertation or Master's thesis or report, or graduate faculty member's publication, in most cases cannot be measured.

Thus at present we recognize that new knowledge is indeed a significant output, but its quantity and quality usually can be evaluated only very roughly.

Public Service

Enhanced public service may result when a college or university offers graduate programs because the public may: a) receive the opportunity to attend lectures and performances, to participate in cultural and scientific events, and to use special facilities associated with graduate program activities, b) receive the special services of interns in practice-oriented programs, and c) find available professors and/or

graduate students who may give useful part-time service as consultants to representatives of the schools, government, or industry in community, regional or national activities.

Intra-Institutional Outputs and Benefits

Within a particular college or university, graduate degree programs may contribute importantly to other institutional programs: a) undergraduate teaching by the professors may be improved as a result of their stimulation to maintain scholarly and research activity in their own special field in relation to graduate students; b) some formal courses, informal faculty contacts, high quality libraries, computers, and the like may become available to undergraduates although maintained primarily to support the graduate program; c) continuing education in the disciplines as well as the practitioners' fields may be offered more easily by institutions with professors teaching in graduate programs in these fields; d) institutional prestige may be enhanced by reason of its offering of a graduate program; e) faculty recruitment and retention may be facilitated; and f) prospects of financial support of the institution by gifts and/or legislation appropriations is enhanced by generation of additional alumni.

Widespread effort has been made during the years since World War II to assist institutions which do not offer graduate programs to maintain undergraduate faculty members able to provide up-to-date science instruction. Thus the National Science Foundation has sponsored undergraduate participation in faculty research, and NSF summer institute activities have been designed to update the education of college science faculty members. This concern has also been acted upon with respect to undergraduate teaching in the social sciences and humanities by the National Defense Education Act officers and others.

5. BENEFITS

Benefits are values placed by individuals, institutions, groups within society, and society at large, upon outputs.

The Literature

Powel and Lamson (46-56) found that the benefits arising from graduate education have been extensively discussed in the literature, and have made a useful summary of these reports. A particular output may yield benefits to three or more beneficiaries: a) completion of a graduate degree program, or a part of such a program, may benefit (i) the student

in terms of his future enjoyment of life, additional marketable skills in teaching, research and management, and prestige; (ii) the public in terms of redistribution of income, additional tax revenues, and "intangibles"; and (iii) the institution in terms of improved faculty teaching and research experience, future alumni donations and prestige, and current and future constituency support; b) teaching and research assistantships may benefit (i) the student by enhancement of his teaching and research skills; and (ii) the institution by enhancement of its student teaching and research effort; c) outputs jointly produced with graduate education, for example, dissertations, public lectures and recitals, and public use of facilities, may benefit (i) the student by his stimulation by campus environment; (ii) the public and also the institution by development and distribution of new knowledge, and by availability of cultural and scientific events.

With respect to evaluation of benefits of graduate education, four approaches run through the literature (PL, 56-72): a) quantification of the relationships between higher education and economic growth; b) evaluation of earnings differentials and attempts statistically to attribute variations to different levels of educational achievement; c) estimation of the demand for various output levels of higher education as a means to approximate total social value for given output levels; and d) consideration of the quantity and quality of inputs to the graduate educational process and thereby, in a sense, avoiding the problem of evaluating outputs.

Commentary

The outputs from graduate degree programs provide benefits to society at large, to donors and taxpayers who help support colleges and universities, to graduate students, and also to the institutions themselves as stated above.

Society receives a unique benefit from graduate education in that a cadre of highly trained men and women are produced without which our highly complex social system could not operate. Thus teachers are educated to provide for the education of young people in the several disciplines by transmitting existing knowledge and cultural wisdom and by training in modes of rational thinking. Practitioners are trained who serve the needs of society in the many fields which are now important. Researchers are identified and developed who contribute - both as graduate students in Ph.D. programs and in their subsequent careers - most of the new knowledge

which our society now needs and expects as a basis for understanding itself better and for solving its many problems. Such specialists may sometimes make significant contributions to the solution of problems outside their field as a result of bringing to bear the particular capability to analyze problems and to propose solutions which they have developed in graduate school and thereafter in the course of their career. Scholars and artists are advanced in their capability to make intellectual and cultural contributions.

Society also receives major benefits from the new knowledge arising from faculty members and students conducting research associated with graduate degree programs and especially in Ph.D. programs. Such knowledge is often fundamental for the development of improvements in the health, economic and societal situation of mankind. Academic research results often form the basis for new and expanded industries and economic growth which eventually make available to society many additional and improved products and services. Artistic products - paintings, compositions, and writings - similarly are provided to society.

Benefits to society arise also in the form of improved public service such as stimulation of the intellectual and cultural life of the community, improved economic productivity, and in other ways.

These benefits accrue to the public at large and thus to all who help finance the institution.

Donors may enjoy sharing in the support needed to provide for continuation or advancement of a selected institution or some of its programs.

Taxpayers supporting state colleges and universities may benefit by having available,within the state, institutions sensitive to the offering of programs of both general and particular interest to its residents. Thus graduates are produced whose talents are needed to provide leadership and professional services, as well as general intellectual and cultural contributions. Some men and women may migrate into a state for graduate work while other residents may leave it and, over the years, these changes probably tend to balance one another. Academic research activities yield men and women trained to find new knowledge, as well as new knowledge itself, and both of these outputs are of major importance in furthering the development of a state.

Taxpayers to the federal government benefit from funds which the government may provide to colleges and universities. Thus national graduate fellowships tend to recruit highly able men and women into graduate degree programs where they are trained and become available for service throughout the country. In fields where special needs exist the development of particular new graduate degree programs may be encouraged and graduate student traineeships may be made available. The nation may benefit from special training experience provided to students from foreign countries.

A major segment of the federal government has found that it can function effectively only if it looks to the future, and develops new ways to deal with new problems. This can be done only by research. Much of the new knowledge needed is basic in character and can best be discovered and developed in the universities by faculty members working in collaboration with graduate students.

The graduate student, of course, finds significant benefits in his graduate education or else he would not seek or continue it. The lifetime money income of a person who takes graduate work may be significantly higher than one who does not. In certain fields, earnings may be higher as the number of years of graduate study are increased, and even though a graduate degree may not be achieved. Professional or employment prospects are enhanced, the graduate student's viewpoints and understandings are widened, his personal prestige is expanded, and he may find special personal satisfaction in the challenge and stimulation of graduate study and research.

Overall, many important benefits to individuals and groups are perceived in the outputs of graduate degree programs.

How much of the cost of graduate education should be paid for by each of the groups and individuals receiving these benefits is a question of great importance.

The existence of joint inputs of monies to an institution (such as graduate student tuitions and fees, state funds, federal funds and private donor and other funds), and of joint outputs such as educated men and women and new knowledge, makes this question especially difficult to answer appropriately. Presentation and discussion of evidence bearing upon what would constitute equitable levels of support from each of the classes of individuals and groups receiving benefits simply cannot be taken up in this brief paper. These matters call for much further study and discussion.

6. COST AND PROGRAM DEFINITIONS

Consideration of the costs of graduate education calls for development of an appropriate set of definitions of costs, and also of programs to which costs may be allocated.

Literature*

Costs of graduate education, according to the Powel-Lamson review of the literature (PL, 83-90) may be considered with respect to the public or society as a whole, the graduate student, or the academic institution.

Public costs are those paid by taxpayers through units of government, and/or by private donors, and consist mainly of institutional costs which are not covered by tuition and fees, potential or actual products or services, income taxes foregone by society because a student is studying in graduate school rather than producing, and also public and private financing of non-institutional costs.

Graduate student costs include outlays for institutional tuition and fees, books and supplies, transportation and also living expenses insofar as these are greater than those which would have been incurred had the student not entered graduate school, and opportunity costs in a sense of foregone net income.

Institutional costs are of several types. Classification of these by type of input is a useful way to organize information because it focuses upon resource components of dollar costs. Thus direct costs are expenditures made by an institution for resources used by a particular organizational unit such as a department which may offer one or more of its "primary" programs. Indirect costs are expenditures for resources used in "supporting" programs, or in units producing outputs which are not distributed to final clients but are used as inputs to the primary program units and, therefore, the outputs of these supporting units are embodied in the outputs of the primary units. Since the costs of all organizational units and all

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*As the final draft of this paper is being assembled, a preliminary draft of a paper titled "Cost Finding Principles and Procedures" by G. Ziemer, M. Young and J. Topping (Technical Report 26, National Higher Education Management System at WICHE, Boulder, Colorado, November 1971) has been made available to us, and in the following text is referenced as "CFPP" followed by the appropriate page numbers. Time does not permit us to extend our Commentary to detailed consideration of this paper in spite of our major concern with some of the assumptions presented and procedures proposed.

outputs produced must be accounted for, thus the costs of support programs, or "indirect costs," must be appropriately allocated to primary programs.

Costs are commonly calculated in one of two ways. Average costs are those obtained by dividing total cost by the number of units produced, and are appropriate for determining the overall net productivity associated with a given level of output. Incremental or marginal costs are those obtained by dividing the increase in cost associated with an increase in production by the increase in number of units produced, and these are relevant to determination of the level of output consistent with maximum effectiveness in use of additional resources.

Five types of cost studies appear in the literature: a) simple input studies report on any or all elements of total expenditures by institutions of higher education; b) direct cost studies focus on activities at different levels of aggregation, but usually just on those units in the last stages of the production process, such as academic departments, and some suggest that only instructional studies provide any basis for inter-institutional or even inter-departmental comparison; c) full cost studies allocate the cost of organizational support units forward to the final outputs in the production process; d) general systems analysis studies apply simple statistical techniques to derive cost relationships from information on aggregate inputs and aggregate outputs; e) total systems analysis studies are models which consist of a number of simultaneous equations, each representing a different aspect of the production process and provide a generalization for the production process relationships of full cost over different output levels.

Commentary

Cost Definitions

At the outset, we wish to emphasize that many different costs can be defined and estimated with respect to graduate degree programs, and each may be highly meaningful in relation to some aspect of graduate education.

For the present purpose we now define the Total Graduate Degree Program Cost as the total monies expended by or through a college or university to provide for the operation of a graduate degree program, for a year of twelve months, irrespective of the source of the funds expended ("Total GDP Cost").

Sometimes it may be desirable or necessary to state totals of costs and yet not include graduate student financial aid, and/or certain

other costs. For these cases, we suggest use of the designation Total GDP Cost (excluding Graduate Student Fellowships and Assistantships and/or Separately Budgeted Research, and/or Sponsored Research, etc.) or the like with appropriate exclusions, in order fully to make clear what cost is being stated. Similar titles may also be used for Unit Cost statements.

One may identify a Total Societal Cost as a statement of the resources needed or used to offer a graduate degree program and to maintain a student in that program in contrast to other options for using the resources. For example, if an academic institution expends, say, $6,000 per year for faculty salaries and all other purposes per graduate student enrolled in a Master's program, and if the graduate student expends $2,000 more for living expenses at the academic institution than he would have spent at home, and also foregoes say $6,000 income which he could have earned in employment had he not been a student, then one may estimate the Total Societal Cost as the sum of these elements, i.e., as $14,000 per Master's student per year plus other opportunity costs such as foregone taxes, etc.

A Total Institutional Cost may be recognized as the total monies expended by or through a college or university to provide for the operation of its programs, irrespective of the source of the funds expended as suggested in Figure 1. Costs are incurred for faculty and staff salaries, for supplies and equipment, and for other purposes, and these costs must be paid for by funds provided to or through the institution by student tuitions and fees, by the public through tax funds and gifts, and from other sources. Within a particular college or university, overall costs must be balanced by income, or else the institution and its graduate programs will wither and soon cease to exist.

The Graduate Student's Cost can be viewed as consisting of three main elements. For example, for an academic year, he may pay tuition and fees amounting to $2,000, his living costs at his college or university may consume $2,000 more per year than would be the case if he were not in graduate school, and he may forego, say, $6,000 per year income from employment which he could have held if he had not attended graduate school, i.e., a total of $10,000 per year. Funds which a graduate student may receive by or through his institution as Fellowships, Traineeships, or as Teaching or Research Assistantships, or from other sources inside or outside of his

institution may decrease his out-of-pocket costs by transferring these to some other payor.

Monies paid from the specified sources of support which help to finance the operation or part of the operation of a college or university may be identified as Donors' Costs, State Taxpayers' Costs, Federal Taxpayers' Costs, etc.

Program and Activity Definitions

Within a college or university, costs must be considered in relation to the institution's main programs or outputs.

For present purposes we identify the three main outputs as educated men and women, new knowledge, and public service. Similarly, representatives of the National Center for Higher Education Management System at WICHE (CFPP, 24-31) have proposed recognition of three primary programs, i.e. Instruction, Organized Research and Public Service.

To produce these outputs, an institution, or an academic unit within an institution, carries out certain activities which may be categorized as instruction, research and public service, based upon the apparently widespread budgetary practice whereby formal instruction such as lecturing and related activities, often as reflected in student credit hours, is carried in one budget, while research activities involving separately budgeted research centers and sponsored research projects and the like are carried on research and other budgets.

A possible pattern for assembling estimated costs relating to a discipline (or perhaps a department, such as chemistry) is illustrated in Figure 2.

To use this approach, the funds reflected in instruction and research and other direct departmental budgets, and in related support and other budgets, first may be identified as a total for the department or unit, and then allocated among the several significant outputs as suggested in Figure 2. Estimation of direct and support costs will be discussed in Section 7. Special attention will be devoted in Sections 8 and 9 to Fellowship and Assistantship Costs and to Research Costs. Our Commentary on Total Costs, Joint Outputs and Unit Costs is given in Section 10.

A Total Graduate Degree Program Cost may be estimated by summing the costs allocated to the education of Master's and Doctor's students and then adding an appropriate part of the costs allocated to the search for new knowledge.

Budgets and Cost Elements	Estimated Costs of Outputs						
	Degree				New Knowledge	Public Service	Total
	Bachelors	Masters	Doctors	Other*			
Instruction Budgets:							
Faculty Compensation							
Teaching							
Research and Scholarship							
Administration							
Committees							
Internal (Instructional) Services							
External (Public) Services							
Teaching Assistant Compensation							
Staff Compensation							
Supplies and Equipment							
Research Budgets:							
Faculty Compensation							
Research Assistant Compensation							
Staff Compensation							
Supplies and Equipment							
Public Services Budgets:							
Faculty Compensation							
Staff Compensation							
Supplies and Equipment							
Special:							
Special Facilities and Staff							
Fellowships and Traineeships							
Support:							
Academic Support							
Student Services							
Institutional Support							
Other							
Total							

* Professional, continuing, non-degree education, etc.

FIGURE 2. POSSIBLE PATTERN OF ASSEMBLING ESTIMATED COSTS RELATING TO A DISCIPLINE OR DEPARTMENT (e.g., CHEMISTRY).

7. DIRECT AND SUPPORT COSTS

To identify and evaluate the direct costs of graduate degree programs, it is necessary to deal with the fact that most colleges and universities maintain the academic department as the budgetary unit. Thus allocations must be made from departmental budgets to provide for the direct costs of producing the traditional outputs of educated men and women, new knowledge and public service.

The support costs associated with a graduate degree program are ascertained by identifying the support activities which provide inputs into the graduate degree program, and then evaluating the costs of these inputs.

Direct Costs

Literature

Direct costs comprise the sum of the expenditures incurred by a primary producing unit such as an academic "department" and usually comprise the following: faculty and staff compensation and benefits, contract services, supplies, equipment, and travel, and sometimes certain costs of research and of fellowships and assistantships. (PL, 85)

Faculty compensation costs usually are the largest components of graduate degree program direct costs. To allocate such costs appropriately among graduate degree programs and other programs, it is useful to identify certain categories of faculty activity, and Powel and Lamson have presented a classification system (PL, 126-129) which is a composite of those reported in the literature.

Procedures designed to permit the estimation of how much time a professor devotes to such activities are in use, although the literature indicates that faculty members tend to resist such analyses. Considerable time and effort are required to carry out such analyses and subjective information tends to result.

Commentary

Faculty activity analysis seems to be the only procedure in sight to secure the information needed for appropriate allocation of faculty compensation and related costs to graduate degree and other programs. Much further developmental work needs to be done to improve faculty activity analyses procedures.

However to illustrate characterization of faculty activity for the present discussion, the main categories recognized in the recent draft statement prepared by L. C. Romney of NCHEMS may be set forth as follows:

1. Teaching Activities: All activities related to teaching courses including teaching of numbered courses, preparing for courses, advising with respect to courses and academic programs, and developing new courses.
2. Research, Scholarship, and Creative Work Activities: All activities related to a definite end product to be shared or to keeping current in a professional field.
3. Administrative Activities: All supervisory or managerial activities related to particular organizational units of the institution.
4. Committee Activities: All activities related to active participation on committees at the institution.
5. Internal (Instructional) Service Activities: All activities related to general contact with persons associated with the institution, to professional responsibilities within other organizational units within the institution, and to fulfilling institutional requests.
6. External (Public) Service Activities: All activities related to services provided to organizations outside the institution.

More detailed information concerning proposed faculty activity categories and subcategories is set forth in the NCHEMS paper.

To estimate faculty compensation costs, the percentage of time which a professor devotes to each of the activities listed above and in relation to each main output, including the graduate degree and research programs as shown in Figure 2, may be evaluated. Appropriate consideration also needs to be given to the time a professor spends in extra-departmental activities, as well as the time which professors from other departments may devote to the subject graduate degree programs.

At best, such estimates will be rough and, of course, the outcome will be somewhat different depending upon how an individual professor behaves, and upon what are the traditions in his discipline or field. If the focus is on assignment or departmental expectations, the distribution desirably may be made by the department chairman or some similar officer who is intimately familiar with both the concepts and workings of the department's program, and equally with the behavior of the particular professor concerned. In cases where both Master's and Doctor's programs are offered, then the time the professor spends on graduate work may be divided appropriately between his activities in relation to pre-Master's students and their programs, and to post-Master's or Doctoral students and their programs.

The costs of research, as reflected in budgets under the responsibility of the academic department and/or other instructional units, likewise need to be allocated appropriately between graduate and other educational programs as well as research and public service. In doctoral degree programs, where the tradition exists of close colleagal collaboration and joint publication between the professor and his graduate students, it may be appropriate usually to allocate the larger percentage of the professor's research time to the department's graduate programs, and less to undergraduate and other programs. However, in other degree programs where some of the professor's research may be conducted rather apart from research in association with his graduate students and where joint publication of research results is not usual, it may be appropriate to allocate a more modest percentage of the professor's research time to the graduate program, and considerably larger percentages to other programs.

The faculty compensation appropriately allocatable to formal instruction and research activities in relation to the graduate degree program may be estimated by multiplying each professor's compensation and related costs by the fraction of his time which he devotes to such activities, and then summing over the costs of all professors who participate in the graduate degree and research programs.

The costs of staff compensation and supplies and equipment, etc. may be allocated among the departmental programs on the basis of the extent of use or availability for use. The compensation of the professors may be a useful "proxy" for distribution of other direct operational costs.

Special and often expensive research facilities are frequently needed in education and research programs; libraries and computers for most all fields, telescopes for the astronomers, particle accelerators for the physicists, ships for the oceanographers, field expeditions for the anthropologists and archeologists, hospital and primate colonies for the biologists, etc. Substantial staff sometimes is needed to man such research facilities. These may be operated through a department, or an interdepartmental or extradepartmental unit, or else outside the institution as a regional or national research center. In each of these cases, an appropriate fraction of the cost of the special facility and staff to be allocated to the graduate degree program needs to be estimated. To facilitate comparison of graduate degree programs including or excluding such costs, we suggest that the costs of Special Facilities and Staff,

in excess of some threshold value, be separately listed.

Graduate student fellowships and assistantships also appear to be a special type of cost which is desirable to identify separately.

Support or Indirect Costs

Literature

Indirect costs as described by Powel and Lamson (PL, 149-200) are the direct costs of support activities. In order to determine the contribution of indirect costs to graduate degree program costs, the indirect costs must be estimated and classified.

Extensive literature exists in this field and the basic nationally accepted policies and procedures are set forth in Circular A-21 of the Office of Management and Budget of the United States government.

Very recently, the National Center for Higher Education Management Systems ("NCHEMS") at WICHE (CFPP, 66-88) has proposed a classification system whereby indirect costs are categorized among four Support Programs and a number of subcategories which include the following: a) Academic Support (Libraries, Museums and Galleries, Audio-Visual Services, Computing Support, Ancillary Support, Academic Administration and Personnel Development, etc.); b) Student Services (Social and Cultural Development, Supplementary Educational Service, Counseling and Career Guidance, and Student Support, etc.); c) Institutional Support (Executive Management, Fiscal Operations, General Administrative Services, Logistical Services, Physical Plant Operations, Faculty and Staff Services, Community Relations, etc.); and d) Independent Operations (Institutional Operations and Outside Agencies.)

Procedures for allocation of indirect costs, according to the literature (PL, 149-167) are of three types: a) allocation of all indirect costs to instructional outputs only, and this procedure appears to be of value for institutions with relatively small research or public service roles, or for very quick estimates; b) allocation of each separate type of support cost directly to each of the final outputs of the academic department, and this arrangement appears to be used most frequently; and c) allocation initially of some support costs to other support units, and then allocation of support costs of the latter units forward ultimately to the outputs of the primary programs, and this procedure, which may be called "recursive," takes into account the fact that there are relationships among the support activities.

In applying procedures for allocation of indirect costs, the guiding principle is use, or availability for use. Two steps are needed. First, it is necessary to identify "proxies," which are measurable variables reflecting the use of intermediate goods and services provided by support activities; and secondly, it is necessary to evaluate and apply appropriate numerical relationships between the proxies and the subject activities.

Some twelve different proxies (PL, 196) have been used fairly extensively as bases for allocation of support costs: total operating expenses; total salaries; academic salaires; total personnel; FTE academic personnel; number of users; number of students; FTE students; student credit hours; total hours of use; and square feet of space.

Total operating expenditures, total salary, and academic salaries appear to have been used most frequently. It is common in institutional cost studies to choose a single proxy for use in making allocations for each indirect cost center, although for library costs it is common to use several proxy measures in arriving at a composite parameter for the distribution of library services.

Commentary

The U.S. Office of Management and Budget Circular A-21 continues to be basically accepted in relation to policies and procedures with respect to indirect costs. However, the NCHEMS classifications and procedures for allocation of support costs seem to be generally promising as useful methods for estimating the support costs of graduate degree programs.

Support cost allocation procedures are discussed in some detail by Powel and Lamson (191-200) who describe a matrix presentation which appears to be particularly useful in analyzing and visualizing the allocations. They recommend use of the "recursive" procedure for conducting detailed cost studies because it makes the least restrictive assumptions about the nature of the process of graduate education. For many applications, total operating expenditures appear to be the preferred "proxy" if a single parameter must be chosen (PL, 199).

Generally, indirect costs for the entire institution in each support category and sub-category first need to be evaluated, and then appropriate allocations are made to particular academic departments, and then in turn to their respective outputs, as suggested in Figure 2.

8. GRADUATE STUDENT FELLOWSHIP AND ASSISTANTSHIP COSTS

Some graduate students receive Fellowships, Traineeships, Scholarships, and partial or full Waivers of tuition and fees, which require no services, but only good standing and satisfactory progress through the student's graduate program. Other graduate students receive Teaching or Research Assistantships and are paid by the institution for their services rendered in carrying out teaching and/or research activities. Graduate students who attend public colleges or universities pay tuition and fees which are often kept at a low level as a matter of public policy, and monies appropriated by state legislatures or other public bodies are provided in favor of the institution.

Literature

The literature indicates that viewpoints differ as to how the costs of graduate student fellowships and assistantships should be considered in calculating the costs of graduate education. Generally, financial aid in the form of additional stipends or grants is regarded as a subsidy or a "transfer" of costs from students to society and not an additional social cost in the same sense as salaries and expenses for supplies, equipment and other operating and capital costs (PL, 211-212). Clearly such transfers are revenue to the student and a cost to the source of the financial aid, whether an academic institution or some other entity.

Commentary

The ability and promise inherent in a new, as well as a continuing, graduate student is a highly important factor influencing the output from a graduate program in terms of the quality and number of graduates produced. Institutions which award substantial financial aid tend to enroll high ability students. The best graduate schools tend to attract the best students, and indeed to an important extent the quality of the graduate students determines the quality of the graduate school itself.

In Ph.D. degree programs, especially, the quality of the enrolled graduate students is of basic importance. Intellectually able, knowledgeable, sensible, hard-working, and indeed creative graduate students are needed and the institution may find it necessary to recruit and maintain some graduate students in part by fellowships and assistantships. Compared to a less able peer, we are convinced that an outstanding graduate student usually will complete his course work and will select his dissertation problem earlier, will advance steadily through his graduate program

requiring less of his professors' time for guidance and with a lower probability of "dropout," will complete a better dissertation sooner, and finally will make more significant contributions to society during the course of his career.

In other graduate degree programs, major benefits also will arise from recruitment and maintenance of high quality students.

In this context, then, we recommend that the costs of recruitment and continuation in a particular graduate program of graduate students who are believed to be necessary as inputs in order to permit the production of Master's and/or Doctor's graduates of the desired quality and nature, should be considered to be a part of the costs of that graduate program.

Non-service appointments, including Fellowships, Scholarships and Gifts and partial or full Awards or Waivers of tuition and fees often go to particularly promising students in order to encourage and assist such students to enter or to continue advanced study at a graduate school. Traineeships are awards sometimes given to attract graduate students into particular fields. Financial aid is now sometimes provided, and often on the basis of need, to ethnic minority graduate students in order to attract such persons into graduate programs. In all of these cases, financial aid funds are expended to attract selected persons into a graduate program and thus should be recognized as one of its costs.

A Teaching Assistant is a graduate student who is employed by a college or university on a part-time basis to assist in carrying out the instructional program of his institution. Often he assists in teaching undergraduates and in these cases we suggest that his stipend usually should be considered to be a cost of the Bachelor's Degree Program. However it may also be appropriate to consider some fraction of his stipend to be an award designed in part to attract or retain graduate students of high ability, and thereby a cost of the graduate program.

A Research Assistant is a graduate student who is employed by a college or university on a part-time basis to assist in carrying out a research activity in his field. Here again he may receive his appointment in part in order to attract or retain him in his graduate program. If he conducts research which is reported in his Master's thesis or Doctor's dissertation, or contributes to the academic program, we believe that the monies paid to him should be considered not only a salary for the

research services which he has rendered, but also a cost to be considered in relation to the graduate program, as is discussed in more detail in Section 9.

If a graduate student is awarded a Waiver or all or part of his tuition and fees, the effect is about the same as an award to him of a fellowship equal in amount, although for a service appointment the potential income tax provides some difference.

Finally, if it is desired not to include graduate student financial aid as one of the graduate program costs, we suggest that the reported costs should be appropriately specified, e.g. Total GDP Costs (excluding Graduate Student Fellowships and Assistantships), etc.

9. RESEARCH COSTS

The interaction of research and teaching often raises questions at colleges and universities. Research activity at academic institutions is now often "sponsored" by an "outside" agency such as the federal government which may provide funds to help pay the costs of a particular research project conducted by a professor assisted by students. Such activities call for special consideration in relation to the costs of graduate degree programs.

Literature

It is commonly acknowledged in the literature (PL, 201-224) that there are substantial interactions among activities within departments producing primary outputs in addition to interactions among support programs. Faculty research activities benefit students as clients of the instructional activities in the form of dissertation research, increased research skill, and improved quality of instruction. The existence of these benefits is sometimes cited as a rationale for allocating some costs of research activities to outputs of the instructional activities.

Four conceptual techniques are discussed by Powel and Lamson as bases for determining the proportion of research costs which should be allocated to instruction: a) faculty activity analyses are conducted to estimate the extent to which research activities result in benefits to clients of the instructional activities; b) the unrecovered costs of total or separately budgeted and internally funded research activities as an estimate of that proportion of research costs allocable to instruction; c) arbitrary proportions are identified from costs previously estimated in primarily teaching-oriented institutions compared with research-oriented

institutions; and d) all costs of research involving either graduate faculty or graduate students are considered to be costs of graduate instruction.

Commentary

Research activities at academic institutions are often supported by "joint inputs" of monies such as from the institutions' "unrestricted" funds, and from "restricted" funds granted by the federal government to the institution to help pay the costs of a particular research project. These research activities often yield "joint outputs" consisting of new knowledge, and also of educated men and women.

The problem is to develop concepts and procedures to deal appropriately with these joint inputs and joint outputs in relation to graduate education.

Research in Ph.D. Programs

The primary objective of Ph.D. programs is to select and train men and women to find new knowledge. In all Ph.D. programs, an essential element is substantial research activity by both professors and graduate students. Thus the following comments on research costs are addressed mainly to Ph.D. programs, but may relate to other graduate degree programs as well.

The basic requirement which must be satisfied to make appropriate the award of the Ph.D. degree is the production and successful defense of a dissertation which sets forth substantial new knowledge, and thus serves to demonstrate that the new Ph.D. awardee can and in fact has produced new knowledge, and presumably has the capability to continue to produce new knowledge throughout his life.

To assist and guide and teach the Ph.D. student how to discover new knowledge, the professors responsible for offering the program must themselves serve as models. Thus they regularly conduct scholarly work and research, and from time to time report their findings of significant new knowledge in the major journals of their fields. The doctoral degree aspirant at the beginning often plays the role of a research apprentice. At a later stage in his graduate program, he usually functions as a research intern or junior colleague in relation to his professor.

Types of Research Costs

The professor's compensation and related costs often are important

cost components associated with academic research* activities and thus special attention needs to be devoted to the highest and best use for this resource. Allocations of part of the cost of his research and scholarly activity to the graduate degree program and in part to the undergraduate programs, and other programs, may be made, for example, by use of Faculty Activity Analysis procedures described above.

Graduate student fellowships and assistantships may be particularly important to assist in the recruitment and continuation of the graduate students who are highly able and creative in research.

To advance the research activities of a professor and his students, monies may be necessary or desirable to provide: research supplies and equipment, staff personnel assistance, travel by the professor or his students to meetings for presentation and discussion of research findings, or travel by other scholars to come to the campus for research conferences. Interdisciplinary research centers or institutes involving professors and/or graduate students may contribute to one or more graduate and undergraduate as well as research programs, and thus the costs of such units need to be estimated and then allocated in appropriate parts to the several appropriate programs. Special research facilities and staff may also be needed.

For research activities, support costs are, of course, incurred and these need to be estimated and allocated appropriately.

The costs of research appropriately associated with the graduate degree programs may be added to other graduate program costs and assembled as suggested in the illustrative pattern of Figure 2.

Effect of Scale of Research Activities

One may ask what is the minimum level of quality and quantity of research activity which is required in order to make appropriate the offering of a Ph.D. degree program. How to identify this threshold level has not yet been generally agreed upon; but, in our opinion, it will have been attained or exceeded in a graduate program involving several professors when it is evident: a) that a spirit of open and critical inquiry and discussion

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*Ph.D. programs, the element set forth above on page 3 as "d) internship or guided introduction to professional practice," will be assumed here to be contained in the graduate student's thesis or dissertation research activity.

prevails among the professors and graduate students with respect to existing and new evidence, propositions and knowledge in their paricular fields; b) that all or most of the professors responsible for offering the Ph.D. program regularly are conducting scholarly work and research and from time to time are reporting significant new knowledge in the major journals of their fields; and c) that graduate students' dissertations usually or often are published in book form or in the major journals of their fields. Further studies are needed to develop objective descriptions of the minimum research quality and scale required to make appropriate the offering of a Ph.D. program.

One may then ask what is the effect on a Ph.D. program of increase in quality and scale of research activities in excess of this threshold level needed to offer a Ph.D. program. To us it seems that by such an increase the Ph.D. student is enriched and stimulated by his association with other professors and graduate students in his field who are engaged in a variety of investigations and reflect creativity in a variety of unique ways.

However, this proposition requires careful qualification in terms of the quality and number of professors concerned. To illustrate, let us consider a certain Ph.D. program and assume: a) that a certain number of professors and a certain fraction of the time of each of these professors is devoted to the program; b) that each professor is highly able and productive in his research field; and c) that the time and intellectual energy which a professor should properly devote to each Ph.D. student is substantial, and thus he can give good guidance to only a limited number of graduate students.

On this basis the limit of research activity desirably associated with a Ph.D. program would have been reached, we believe, when a further increase would result in one or more of the following outcomes: a) reduction or dilution in the quality of the experience gained by students in the graduate program as a result of decreased time and attention which the student would receive from his professors, and/or of decreased availability of scholarly facilities; b) reduction in the number of graduate students which can be accommodated in the program, and perhaps a related increase in number of staff or technician personnel; and c) major expansion in costs to the institution in support programs, e.g. libraries, computer

facilities, etc. Prior to reaching such a limit, additional funds invested in research activity would be expected to yield diminishing returns.

These comments do not lead to immediately useful procedures and yet we hope they may be found helpful as a base for further studies directed toward estimation of what fraction of the resources should be considered as contributing support for its graduate degree programs.

Sponsored Research

Over the years since World War II, the National Science Foundation, the National Institutes of Health, and other agencies of the federal government, as well as private and not-for-profit companies, have provided "restricted" funds to pay fully or in part for certain research activities at some colleges and universities.

The main objective or intent of the sponsoring agency or company usually is to arrange for the carrying out of a particular research project in order to secure the exploration which it desires or needs. Placement of a research project at an academic institution may occur: a) because basic research is needed and industrial research laboratories cannot easily conduct such research; b) because of recognition of unique research competence in certain faculty members; c) because a certain investigation needs to be conducted with objectivity and the results published with full public discussion and without proprietary restrictions; and d) because of a desire to encourage research activities and training of research personnel at academic institutions and in certain fields. On the basis of the intent of the sponsor, and whichever of these reasons may be compelling, the outcome usually is that a certain piece of research is described in a proposal written by and reflecting the interests and quality of the professor who serves as the Principal Investigator for the project, the proposal is reviewed and may be approved by the sponsor, and the research is then carried out in the academic institution.

Some sponsored research at academic institutions - and infrequently we believe - provides for no substantial involvement with faculty, students, and present or future academic programs, and is conducted, for example, as an accommodation to assist the nation in times of special need or emergency.

However, an important objective or intent of a college or university which undertakes responsibility for a sponsored research project, in view of its primary and unique role as an educational institution, presumably

is the enhancement of its academic program which may result, for example: a) from faculty and student learning and intellectual stimulation by participation in the research activities; b) from the availability of increased research supplies and equipment, and sometimes special facilities; c) from the availability of additional graduate student opportunities in terms of research assistanships, and possibly provision of post-doctoral and other research staff appointee stipends.

Thus we seem to see two parties accepting the terms of a single agreement to carry a research project and yet holding somewhat different objectives, i.e., the sponsor desiring to arrange for the carrying out of a research activity expected to produce needed new knowledge, and the college or university desiring to arrange for the carrying out of a research activity expected to provide the service needed by the sponsor, and also expected to enhance its academic programs.

That two parties hold somewhat different intents and yet are able to accept the terms of a single agreement is a common contractual situation. That both the sponsors and the colleges and universities find satisfaction in the relationship is evidenced by the continuation and steady growth of sponsored research in academic institutions through the decades since World War II.

Research conducted in favor of an extra-institutional sponsor, whatever contributions it may make to the institution's educational programs, subjects the institution to significant costs, both direct and indirect, which should be met fully by the sponsor because he receives research activity and the prospect of new knowledge outputs which he bargained for.

Concluding Comment

Our basic conclusion is that research is an essential part of most graduate degree programs, and thus research costs to an appropriate degree must be considered as part of graduate degree program costs.

At the same time it may be useful for other purposes to assemble under the rubric of Research the costs of all activities which are conducted throughout the college or university and directed toward search for new knowledge.

10. TOTAL COSTS, JOINT OUTPUTS AND UNIT COSTS

Total Graduate Degree Program Cost has been defined as the total

money irrespective of the source provided by or through the academic institution to support the subject graduate degree program.

These costs will vary widely. Doctor of Philosophy programs may be expected to be considerably more costly than Master's programs because of the essential research elements and of the usual rather extensive individual student-faculty interactions which are at the core of the Doctor's program. At a particular level, total costs may be expected to vary by field, and to be higher in the natural sciences and other fields where laboratory experimentation is a traditional part of Master's theses and Doctor's dissertations.

Among institutions, total program costs in a particular field at a particular level may be widely different because of differing institutional policies with respect to graduate student-professor ratios, type and scale of research activities and of graduate student fellowships and assistantships believed to be necessary and feasible to support, and other factors.

Marginal costs comprise the expense of establishing a Master's program at a Bachelor's institution, or of adding a Doctor's program in a field in which the institution already is offering a Master's degree. These costs are of much importance but cannot be addressed in this brief Commentary.

Joint Outputs

Recognizing that joint outputs arise from graduate degree programs, e.g. educated men and women and also new knowledge, one may ask what fraction of the costs of a program may appropriately be allocated to the educational outputs and what part to the new knowledge outputs?

If the entire cost of the graduate degree program is allocated to educational outputs, then the values, for example, as presented in dissertations and in graduate student and graduate faculty publications, are erroneously presumed to be zero.

On the other hand, if the entire cost of a research activity in which professors and students participate is allocated to new knowledge outputs, then the values of the educational experiences received by the professors and their students are also erroneously presumed to be zero.

Something in between may be the answer.

For sponsored research, the funds provided by a sponsor to a college or university to help pay for agreed-upon professor and student

research activities might be considered to establish a cost or price or value of the new knowledge presumably to be produced. If these sponsored research costs are included in full as part of the total graduate program costs, the latter will vary widely depending upon how much sponsored research is being conducted in a given field and at a given institution. However, if sponsored research costs are not included, at least in part, then the true cost of the graduate student's apprentice research exposure will be seriously understated. Of course the converse is also true.

Our view is that some fraction - and regretfully we are unable to suggest clear criteria for evaluation of this fraction - of the cost of sponsored research activities which involve professors and graduate students should be included as part of the total costs, and that in any case the reported cost estimates be clearly defined, e.g. Total Graduate Degree Program Costs (excluding ____% of Sponsored Research Costs), etc.

More generally, and for example for separately budgeted research centers and "departmental research" costs, similar problems appear to exist in estimating a price or a value or indeed a measure of the quality and quantity of new knowledge arising in part from the graduate degree program. What seems to be needed is a "new knowledge" parameter. However, such an entity is unavailable, and we conclude that specific evaluation of new knowledge output is not now and may never be possible except in quite general terms and in a few special cases. Thus again we can suggest only that some fraction of the costs of separately budgeted centers and departmental research and the like should be included as part of the total graduate degree program costs, and that in any case the reported cost estimates should be clearly defined.

Unanswered then remains the question: what proportion of the cost of research activities conducted by professors and students in colleges and universities should be considered to be a cost of educating students, and what proportion should be considered to be a cost of searching for new knowledge?

Perhaps a correct answer to this question does not exist, but in any case we recommend further study of this important symbiotic relationship.

Unit Costs

It is desirable to be able to compare the costs of graduate degree programs in which different numbers of students are enrolled, and among different fields and at different levels within and among institutions.

For this purpose it would be useful to be able to identify and evaluate a unit cost defined as the Total Graduate Degree Program Cost divided by the number of units of output produced per unit of time, say per year of twelve months.

The problem is to identify and evaluate the output units appropriate to divide into Total Costs.

Since the main output is the several educated men and women who receive graduate degrees, and setting aside joint unit output questions, a Graduate Degree Unit Cost may be appropriate to estimate by dividing Total Cost by the number of graduate degrees awarded per twelve month year. Although simple, this procedure provides difficulties arising from: a) random fluctuations in the number of degrees awarded in a particular year; b) variations in length of time needed to complete a graduate degree; c) amount of value added with respect to graduate students who do not complete their degrees; and d) differences in quality among degree awardees.

An alternative is the Enrolled Graduate Student Unit Cost based upon the number of full-time equivalent graduate students enrolled for a year of twelve months, or less desirably, of nine months. A further alternative is the Graduate Student Credit Hour Unit Cost which may be approximated by dividing Total Cost by the number of Graduate Student Credit hours generated per year. These entities are not wholly satisfactory because they do not recognize that completion of a graduate degree usually includes fulfillment of comprehensive and final examinations, theses or dissertations which are requirements to be met in addition to completion of any specific enrollment period or number of course credit hours.

To relate these annual unit costs to Graduate Degree Unit Costs, two additional pieces of information are needed: a) the length of time required by a graduate student to complete his degree program; and b) the percentage of graduate students who complete their degrees relative to those admitted. For the almost 30,000 students who were awarded Ph.D. degrees during 1970, the median registered time in years from baccalaureate to doctorate proved to be 5.6 years, and was nearly the same for all fields reported (National Research Council, Manpower Studies Branch, Office of Scientific Personnel: OSP-MS-4; March 1971). For Master's degrees, one to two years of post-baccalaureate study is usual. The percentage of entering students who earn graduate degrees varies substantially among fields and institutions and thus at present calls for evaluation of individual cases.

In general, each of the unit costs defined above has advantages and disadvantages. However, we recommend that the Graduate Degree Unit Cost be regarded as the preferred statement, with the Enrolled Graduate Student Unit Cost and the Graduate Student Credit Hour Unit Cost as less desirable alternatives to be used as may be necessary or convenient.

11. AVAILABLE ESTIMATED COSTS

A great deal of effort in the Gradcost study was devoted to collecting and analyzing the cost data which was available in the literature.

Literature and Available Estimated Costs

Of the more than 2,000 pieces of literature reviewed by Powel and Lamson (PL 237-255), only some 35 institutional cost studies were found which contained numerical data relative to graduate education. Twenty-six of these studies were deemed to be potential data sources, after having eliminated those with very highly aggregated data and very narrow data elements. Of these, 20 proved to be informative; but in the final analysis of these, only four separate studies were found to contain roughly comparable data by discipline and level of graduate education. This available cost data was secured in most cases in studies carried out at public colleges and universities.

Looking toward estimation of Total Costs, this information was studied; and it became clear that wide variation existed in the policies and definitions and procedures which had been used to generate the available cost data. Faculty salary costs often were calculated by differing methods; and most often were pro-rated to instruction on the basis of reported hours spent in instruction and departmental research categories, while salary costs attributable to sponsored or separately budgeted research and to public service were omitted.

Powel and Lamson then turned attention to Direct Instructional Costs which mainly comprise faculty compensation and related costs associated rather directly with formal instruction activities. Here, too, it was found among the available studies that consistency did not exist in the defintiion of Direct Instructional Costs, the means by which faculty salaries were calculated (e.g. whether actual or averaged over some particular dimension such as faculty rank), the portions of salaries and overhead costs separated out as the costs of research and public service and other activities in the definitions of Doctor's and Master's level of instruction, etc.

In these studies, attempts were made in accord with one of the objectives of the Gradcost Study, "...to identify and evaluate, insofar as practicable and possible, by discipline, by level, by apparent quality of the graduate degree program, and by type of institution...illustrative data giving ranges of total costs...,". The particular correlations considered and the results obtained are described by Powel and Lamson (PL, 245-256).

Generally our conclusion is that the desired reliable illustrative cost data, including both Total Costs and Direct Instructional Unit Costs of graduate degree programs, are simply not available at present from the literature.

However, to permit some comparisons to be made, the available unit cost data were adjusted by Powel and Lamson to a common basis using a specially designed computer program. The full-time equivalent student measure (FTE) for an academic year of nine months was selected as the "unit" basis for comparision. Studies presenting costs in terms of quarter or semester student credit hours were normalized by arbitrarily defining an FTE student as one who generated 30 quarter student credit hours over the academic year, or 20 semester student credit hours over the academic year, and then by multiplying semester costs by two and quarter costs by three. The several sets of available cost data had been assembled at different times over a period of eight years, and the costs were adjusted to "1970 dollars" by applying a Price Index of Private Higher Education of the Department of Commerce (Office of Business Economics, National Income Division) for years other than 1970. Procedures were also carried out to guarantee anonymity for the four main studies and 13 institutions concerned, as was promised at the time of collecting the data.

The normalized available estimated Direct Instructional Unit Cost ranges associated with Master's and Doctor's level programs in 22 disciplines or fields are given in Figures 3 and 4 in terms of 1970 dollars per full-time equivalent graduate student per year of nine months. Doctor's degree program unit costs mean those associated with post-Master's degree graduate work.

For each field and level, the tabulations show the approximate number of such graduate degree programs offered in the United States and also the numbers of programs for which unit cost data have been found available and been included in developing the cost figures.

Discipline	Number of Programs Offered in U.S.(b)	Number of Program Cost Estimates Available	Ranges(c) of Unit Costs		
			Direct Instruction	"Full"	Total
Humanities					
Classics	77	4	2000, 2000--2000, 2500	For the few available studies presenting data by departments, the ratio of unit "Full Costs" (i.e., total costs exclusive of graduate student fellowships and assistantships and of separately budgeted research costs) to unit Direct Instructional Costs ranged from 1.3 to 1.9, (PL, 245).	Total Unit Costs may be estimated by multiplying Direct Instruction Unit Costs by 1.3 to 1.9 and then adding the unit costs of graduate student fellowships and assistantships and of separately budgeted research, as may be appropriate.
English	425	19	600, 800--2300, 2500		
German Languages	111	14	700, 800--2600, 3600		
Philosophy	120	13	600, 600--4000, 6200		
Romance Languages	165	8	1000, 1100--1600, 1700		
Social Sciences					
Anthropology	72	10	600, 900--1700, 3200		
Business Admin.	262	19	400, 500--1600, 1200		
Economics	194	15	600, 600--1700, 2000		
Geography	101	16	300, 600--2900, 3400		
History	361	16	700, 700--1600, 1700		
Psychology	272	20	400, 500--1800, 7000		
Sociology	191	15	500, 500--1100, 1200		
Biological Sciences					
Botany	84	6	2000, 2300--3500, 3800		
Zoology	98	6	2100, 2100--2400, 2600		
Physical Sciences					
Astronomy	30	8	2200, 2400--6700, 9000		
Chemistry	299	22	600, 1500--4500, 5000		
Geology	120	12	1700, 2400--5400, 7100		
Mathematics	372	22	600, 600--3300, 5500		
Physics	256	20	400, 700--4500, 4800		
Engineering					
Chemical Engrng.	118	12	2100, 2500--5500, 7100		
Electrical Engrng.	150	12	1300, 1500--4000, 4800		
Mechanical Engrng.	143	12	1400, 1800--4300, 6900		

(a) Available estimates arose from only four separate studies in most cases carried out at public colleges and universities. (b) The basis used by Powel and Lamson for estimating the number of graduate programs offered in the United States in each discipline is described in detail in their paper (PL, 247). (c) Cost ranges are presented in terms of the lowest, next to lowest, next to highest, and highest cost estimates. In our opinion, some of the figures giving the low ends of the ranges do not represent all of the elements even of the Direct Instructional Costs associated with a good quality graduate degree program.

FIGURE 3. AVAILABLE ESTIMATES(a) OF RANGES OF UNIT COSTS - MASTERS DEGREE PROGRAMS
(1970 Dollars/9 month FTE Student Year; Powel-Lamson, 246-247)

Discipline	Number of Programs Offered in U.S.(b)	Number of Program Cost Estimates Available	Ranges(c) of Unit Costs		
			Direct Instruction	"Full"	Total
Humanities					
Classics	41	4	3000, 3700--3700, 4600	For the few available studies presenting data by departments, the ratio of unit "Full Costs" (i.e., total costs exclusive of graduate student fellowships and assistantships and of separately budgeted research costs) to unit Direct Instructional Costs ranged from 1.3 to 2.6, (PL, 245).	Total Unit Costs may be estimated by multiplying Direct Instruction Unit Costs by 1.3 to 2.6 and then adding the unit costs of graduate student fellowships and assistantships and of separately budgeted research, as may be appropriate.
English	92	9	1100, 1300--2600, 3500		
German Languages	48	9	600, 800--1600, 2000		
Philosophy	65	8	1900, 2100--3300, 4100		
Romance Languages	65	9	1400, 1500--2600, 3400		
Social Sciences					
Anthropology	42	9	1600, 1800--3200, 3400		
Business Admin.	57	7	500, 1500--3800, 7700		
Economics	91	8	1300, 1900--3300, 3600		
Geography	34	6	2200, 2900--5600, 7700		
History	91	8	1200, 2200--3800, 5100		
Psychology	110	10	1100, 1700--2900, 7600		
Sociology	73	9	1600, 1600--4100, 4900		
Biological Sciences					
Botany	97	6	3300, 3900--6900, 7300		
Zoology	95	6	3200, 3500--4700, 7200		
Physical Sciences					
Astronomy	35	5	4000, 10,100--15,500, 15,700		
Chemistry	125	13	1900, 2500--6200, 6400		
Geology	67	8	4200, 4300--11,100, 13,900		
Mathematics	102	11	1100, 1400--3600, 6200		
Physics	113	9	1600, 2700--7600, 11,100		
Engineering					
Chemical Engrng.	73	7	2500, 4600--8200, 9100		
Electrical Engrng.	78	7	1700, 2800--5600, 5600		
Mechanical Engrng.	71	6	2500, 3600--5700, 6900		

(a) Available estimates arose from only four separate studies in most cases carried out at public colleges and universities. (b) The basis used by Powel and Lamson for estimating the number of graduate programs offered in the United States in each discipline is described in detail in their paper (PL, 249). (c) Cost ranges are presented in terms of the lowest, next to lowest, next to highest, and highest cost estimates. In our opinion, some of the figures giving the low ends of the ranges do not represent all of the elements even of the Direct Instructional Costs associated with a good quality graduate degree program.

FIGURE 4. AVAILABLE ESTIMATES(a) OF RANGES OF UNIT COSTS - DOCTORS DEGREE PROGRAMS
(1970 Dollars/9 month FTE Student Year; Powel-Lamson, 248-249)

The ranges found for each field and level are given in terms of four numbers; the lowest, the next to lowest, the next to the highest, and the highest available estimated Direct Instructional Unit Cost per full-time equivalent graduate student per academic year.

Further investigation by Powel and Lamson (246) suggested in a most preliminary way that the ranges in ratio of Total Unit Costs (excluding Graduate Student Fellowship and Assistantship Costs and Separately Budgeted Research Costs) to Direct Instructional Unit Costs comes out at about 1.3-1.9 for the Master's level, and 1.3-2.6 for the Doctor's level.

Commentary

In view of the weaknesses inherent in the available data as a result of inconsistencies in definitions and evaluations of Direct Instructional Unit Costs, and of the non-representative nature of the small number of public institution costs which comprise the available sample, the wide ranges evident in the available estimated Direct Instructional Unit Costs are understandable although quite unhelpful with respect to achievement of some of the objectives of the Gradcost study. Indeed, we believe that some of the figures giving the low ends of the ranges do not represent all of the main elements even of the Direct Institutional Unit Costs associated with a good quality graduate degree program. Thus, we again emphasize that the numbers set forth in Figures 3 and 4 must not be taken as illustrative costs but only as highly preliminary estimates available for present consideration.

However, one does sense in the figures the expected substantially higher costs of Doctor's relative to Master's programs, and also of the programs in the sciences and other fields which traditionally include extensive laboratory work and close graduate student-professor relations.

The remaining wide ranges, we speculate, may occur as a result of such differences as: a) the number and quality of graduate faculty professors who participate in the graduate degree program per enrolled graduate student; b) the effects of sometimes rapid expansion or contraction in graduate student enrollment while the number of professors offering the program changes much more slowly; c) the nature and scale of the research costs allocated to the graduate program; d) the nature and scale of graduate student fellowship and assistantship allocations; e) the differing costs of certain specializations which may be an important emphasis in a particular graduate degree program at one but not at another

institution (e.g. social psychology vis a vis clinical psychology, etc.); and f) institutional policies and practices with respect to treatment of operating and capital costs of special facilities and of staff, e.g. telescopes in astronomy programs, etc.

To improve the comparability even of Direct Instructional Unit Costs, agreements must be obtained with respect to the several definitions and procedures which are appropriate to apply to estimate the desired costs.

To estimate Total Unit Costs, the ranges of Direct Instructional Unit Costs may be multiplied by the appropriate above-stated ratios, and to these products then are added the graduate student fellowship and assistantship costs and also the proportion of separately budgeted and sponsored research costs which may be properly associated with the graduate degree program. Costs per graduate degree awarded may be estimated by multiplying annual costs by the time required to complete the degree, taking appropriate account of graduate students who do not complete the program.

In general, information is not available at present to permit the making of meaningful estimates of the Total costs of graduate programs. Thus strong encouragement should be given to the continuation of current studies, and the inauguration of further studies of the cost of graduate education in order to find answers to the many difficult questions which still remain.

12. CONCLUSIONS AND RECOMMENDATIONS

A. Only very limited information and solid data exists concerning the costs and benefits of graduate education in the United States, as judged from the extensive literature which has been searched and summarized in the course of the Gradcost study.

B. As the basis for consideration of the costs and benefits of graduate education, the appropriate unit is the "graduate degree program," which may be defined as a set of experiences offered by the graduate faculty in a particular discipline or field which, if satisfactorily completed, leads to the award of the degree of Master or Doctor. The elements of graduate degree programs have, in general, been agreed upon and are described in a series of statements endorsed by the Council of Graduate Schools in the United States, and by the Association of Graduate Schools in the Association of American Universities.

C. The primary output from a graduate degree program is men and women trained to the level of Master or Doctor in a particular field, and auxiliary and joint outputs consist of new knowledge resulting from research activity, public service, intrainstitutional influences and other entities. Quality as well as quantity need to be taken into account when considering the output of men and women receiving graduate degrees, and also the output of new knowledge.

D. Benefits are values perceived in the outputs of graduate education, and these accrue to graduate students, to the public and society, who include both taxpayers and donors, and to the other units in the college or university which offer a graduate degree program. Generally, it is these beneficiaries who provide the funding to the academic institution and in turn provide for carrying out the graduate degree programs.

E. The costs of a graduate degree program may be defined as the monies used to provide the overall experience offered to graduate students within the graduate degree program, whatever the source of funds.

F. Research at colleges and universities which is conducted by professors and students usually yields both new knowledge and educational outputs. The costs of such research, whatever the source of funds, may be assembled appropriately on the one hand under a classification called Research to set forth the total institutional commitment to search for new knowledge. On the other hand, with equal appropriateness, part of these costs of research may be assembled under a classification called the Graduate Degree Program to reflect the resources contributed in support of a graduate degree program.

G. Fellowships, Traineeships, Assistantships and other financial aid are sometimes provided to recruit graduate students of high ability or of certain ethnic cultures into particular graduate degree programs, and in most cases it seems appropriate to consider the costs of such activities at least in part as costs of that graduate degree program.

H. Since graduate degree programs are generally carried out under the responsibility of the faculty in a particular department or school which serves as the budgetary unit, thus the direct costs of a graduate degree program are identified as an appropriate proportion of the academic and research budgets of the department responsibility of the faculty in a department. Faculty salaries are the most important item and the appropriate

proportion of such salaries to allocate to a graduate degree program apparently may best be estimated by carrying out a faculty activity analysis.

I. Indirect costs are those associated with support programs, such as Student Services, Academic Support, and Institutional Support. The allocation of an appropriate fraction of indirect costs to a particular graduate degree program may be developed by identification and application of "proxies" which appear to be proportional to the elements of costs in the program.

J. Total costs of graduate degree programs on an illustrative basis are simply not available. However, Powel and Lamson have found within the literature a small number of costs estimates and this data has been reported in terms of Direct Instructional Unit Costs. A range of ratios relating this parameter to the Total Costs, excluding costs of sponsored research and graduate student financial aids, has been suggested for Master's and for Doctor's degree programs.

K. It is clear that the basic definitions, procedures and data are not yet available for evaluating costs of graduate education by discipline, by field and by type of institution and that much more extensive studies on these matters and on the outputs and benefits are needed.

L. It is recommended that additional studies be carried out as rapidly as possible to provide the information which is needed; that studies already in progress by WICHE and other interested groups should be strongly encouraged; and the results of such studies be reported as soon as practicable in order to provide a sound basis for the public policy and institutional decisions which are now being called for relative to the costs and benefits of graduate education.